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11 CHEMICAL REACTIONS

Chapter Test A

A. Matching

Match each description in Column B with the correct term in Column A. Write the letter of the correct description on the line.

Column A	Column B
_____ **1.** coefficient	**a.** a chemical equation that does not indicate relative amounts of reactants and products
_____ **2.** spectator ion	**b.** a starting substance in a chemical reaction
_____ **3.** combustion reaction	**c.** a list of metals in order of decreasing reactivity
_____ **4.** reactant	**d.** a reaction in which a single compound is broken down into simpler substances
_____ **5.** skeleton equation	**e.** a whole number that appears before a formula in an equation
_____ **6.** balanced equation	**f.** a new substance formed in a chemical reaction
_____ **7.** activity series	**g.** a particle not directly involved in a chemical reaction
_____ **8.** product	**h.** an equation in which each side has the same number of atoms of each element
_____ **9.** decomposition reaction	**i.** a reaction in which the atoms of one element replace the atoms of a second element
_____ **10.** single-replacement reaction	**j.** a reaction in which oxygen reacts with another substance, often producing heat or light

B. Multiple Choice

Choose the best answer and write its letter on the line.

_____ **11.** The symbol Δ in a chemical equation means:
- **a.** heat is supplied to the reaction.
- **b.** a catalyst is needed.
- **c.** yields.
- **d.** precipitate.

_____ **12.** A catalyst is:
- **a.** a solid product of a reaction.
- **b.** one of the reactants in a single-replacement reaction.
- **c.** not used up in a reaction.
- **d.** the product of a combustion reaction.

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_____ **13.** When the equation $Fe + O_2 \rightarrow Fe_2O_3$ is balanced, the coefficient for O_2 is:
a. 4 **c.** 2
b. 3 **d.** 1

_____ **14.** The reaction in question 13 is an example of a(n):
a. aqueous reaction. **c.** combination reaction.
b. single-replacement reaction. **d.** decomposition reaction.

_____ **15.** The equation $H_3PO_4 + 3KOH \rightarrow K_3PO_4 + 3H_2O$ is an example of which type of reaction?
a. double-replacement **c.** decomposition
b. combination **d.** single-replacement

_____ **16.** In a double-replacement reaction:
a. the reactants are usually a metal and a nonmetal.
b. the reactants are generally two ionic compounds in aqueous solution.
c. one of the reactants is often water.
d. energy in the form of heat or light is always produced.

_____ **17.** In order for the reaction $2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq) + 3H_2(g)$ to occur, which of the following must be true?
a. Al must be above Cl on the activity series.
b. Al must be above H on the activity series.
c. Heat must be supplied for the reaction.
d. $AlCl_3$ must be a precipitate.

_____ **18.** In a double-replacement reaction:
a. one of the products is always a gas.
b. one of the products must be an element.
c. positive ions are exchanged between two compounds.
d. all of the above

_____ **19.** When the following equation is balanced, the coefficient in front of HCl is:

$$Ba(s) + HCl(aq) \rightarrow BaCl_2(aq) + H_2(g)$$

a. 6 **c.** 1
b. 3 **d.** 2

_____ **20.** The equation in question 19 is an example of which type of reaction?
a. combustion **c.** decomposition
b. single-replacement **d.** double-replacement

_____ **21.** This symbol $\rightleftharpoons$ indicates:
a. that heat must be applied.
b. an incomplete combustion reaction.
c. that a gas is formed by the reaction.
d. that the reaction is reversible.

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_____ **22.** Which of the following statements is *incorrect*?
- **a.** Complete combustion has occurred when all the carbon in the product is in the form of carbon dioxide.
- **b.** A single reactant is the identifying characteristic of a decomposition reaction.
- **c.** The only way to determine the products of a reaction is to perform the reaction.
- **d.** All chemical reactions can be classified as one of four general types.

_____ **23.** A chemical formula written above or below the yield sign indicates:
- **a.** that a gas is formed.
- **b.** that the substance is used as a catalyst.
- **c.** that heat must be supplied.
- **d.** a reversible reaction.

_____ **24.** The equation $2C_3H_7OH(g) + 9O_2(g) \rightarrow 6CO_2(g) + 8H_2O(g)$ is an example of which type of reaction?
- **a.** combustion
- **b.** combination
- **c.** double-replacement
- **d.** decomposition

_____ **25.** A double-replacement reaction takes place when aqueous K_2SO_4 reacts with aqueous $Pb(NO_3)_2$. You would expect one of the products of this reaction to be:
- **a.** K_2S.
- **b.** NaPb.
- **c.** $PbSO_4$.
- **d.** CNO_3.

C. Problems

Solve the following problems in the space provided. Show your work.

26. Balance the following equations:

a. $Ca(s) + H_3PO_4(aq) \rightarrow Ca_3(PO_4)_2(s) + H_2(g)$

b. $KBrO_3(s) \rightarrow KBr(s) + O_2(g)$

c. $(NH_4)_2CO_3(aq) + NaOH(aq) \rightarrow Na_2CO_3(aq) + NH_3(g) + H_2O(l)$

27. For each equation in question 26, identify the type of reaction.

a. _____

b. _____

c. _____

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28. Balance the following equations. Indicate whether combustion is complete or incomplete.

a. $C_5H_{10}(g) + O_2(g) \rightarrow CO(g) + H_2O(g)$

b. $C_3H_7OH(l) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$

29. Complete and balance the following equations. Then write each as a net ionic equation.

a. $K_3PO_4(aq) + MgCl_2(aq) \rightarrow$

b. $Fe(NO_3)_3(aq) + Na_2CO_3(aq) \rightarrow$

D. Essay

Write a short essay for the following.

30. What determines whether one metal will replace another metal from a compound in a single-replacement reaction?